Running head: EVALUATION OF THE "HEALTHY BEGINNINGS" PROGRAM

Graduate Management Project
(GMP)

Evaluation of "Healthy Beginnings";
Fort Carson's Pregnancy Physical Training Program

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Table of Contents

ABSTRACT

As the operational tempo of the armed services increases, all soldiers are expected to be in top physical condition to endure military operations and increase unit readiness. With women now making up 11 percent of the military, special issues, such as pregnancy, become significant to the health and readiness of the Armed Forces. Fort Carson's Mountain Post Wellness Center initiated a mandatory pregnancy physical training program, named "Healthy Beginnings", as an effort to maintain physical condition during pregnancy and after delivery. This retrospective study evaluates "Healthy Beginnings" to determine if frequent attendees of the program actually had healthier pregnancies, fewer complications, and a quicker recovery of aerobic and strength fitness than soldiers who attended less frequently. Using attendance rosters and obstetric records, 111 soldiers are divided into two groups. Those who attended "Healthy Beginnings" 50 percent of the time or greater, over the course of the soldier's pregnancy and in the six months allotted for post-partum recovery, are compared to those who attended less than 50 percent of the time. Four variables are used in the comparison: gestation period, presence or absence of complications during pregnancy or delivery, weight gain, and pass or failure of the record Army Physical Fitness Test (APFT). The chi square test is used to analyze the variables "complications" and "APFT", and the Student's t test is performed on the remaining variables. At $p < 0$ .05, a significant difference between exercise groups was found only for the APFT variable, where frequent attendees of the program were significantly more likely than infrequent attendees to pass the record APFT while in the post-partum phase. Recommendations are made to continue "Healthy Beginnings" because of the social, psychological, and educational benefits it has to

offer active duty soldiers, and that improvements in administration of the program could better demonstrate its effectiveness.

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

Active Duty (AD)

American College of Obstetricians and Gynecologists (ACOG)

American College of Sports Medicine (ACSM)

Army Physical Fitness Test (APFT)

Army Medical Department (AMEDD)

Army Medical Department Center and School (AMEDDC&S)

Army Regulation (AR)

Center for Health Promotion and Preventive Medicine (CHPPM)

Department of the Army (DA)

Department of Defense (DoD)

Evans Army Community Hospital (EACH)

Health Affairs (HA)

Physical Training (PT)

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Standard Form (SF)

INTRODUCTION

Exercise has become a vital part of readiness in the military. All soldiers, male and female, must be in top physical condition to endure the hardships associated with military operations, during times of both peace and conflict.

With women now making up 11 percent of the Army, totaling nearly 84,000 personnel (Borsay-Trindle & Pass, 1991), special issues arise in terms of health and readiness. One particular issue is pregnancy, where at Fort Carson, Colorado, nearly 200 soldiers are pregnant at any one time (PM Careline, 1998). While this large number of non-deployable soldiers degrades a unit's readiness status, the Wellness Center at Fort Carson responded with measures to reduce the readiness impact of pregnancy. The Mountain Post Wellness Center initiated a mandatory pregnancy physical training (PT) program, named "Healthy Beginnings", for all pregnant soldiers assigned to the post in an effort to maintain physical conditioning during pregnancy and the post-partum period. The complementary goal of this program is to increase the chances for a healthy pregnancy and birth, and to decrease pregnancy risks to both the mother and child.

Conditions Which Prompted the Study

The Wellness Center staff is aware of the inherent benefits of the specialized pregnancy PT program, but thus far could not demonstrate its effectiveness. There remains no published research that examines the outcomes of the Fort Carson program to justify mandatory attendance in a segregated program. As a consequence, there is no scientific evidence to warrant the substantial investment of personnel and time in an exercise group

for pregnant soldiers, or to separate these soldiers from their individual unit PT so as to participate in this special program. In an environment of limited resources and efforts to maintain unit discipline and cohesion, research is necessary to confirm that the program is a benefit to soldiers, their babies, and unit readiness.

At the time that the Wellness Center implemented pregnancy PT, no standard Army or Department of Defense (DOD) program existed. Installations were governed by DoD directive 1308.1, which merely recommends the implementation of pregnancy PT programs, but no specific guidance on conducting PT for pregnant and post-partum soldiers was available. Following both the Center for Health Promotion and Preventive Medicine (CHPPM) guidelines and the American College of Obstetricians and Gynecologists (ACOG) recommendations, personnel at the Wellness Center constructed a program to meet the needs of this special population. There was, however, no documented evidence that the goals of more favorable outcomes of pregnancy or improved return to pre-pregnancy fitness were being achieved.

The Research Question

The question that prompted this research is threefold. Does frequent participation in the "Healthy Beginnings" program influence pregnancy, delivery, or recovery? Only when these questions are answered will we know the effectiveness of the program and its impact on unit readiness.

Literature Review

In 1985, as a response to the "fitness boom" of the 1970s and the growing popularity of prenatal fitness programs, the ACOG issued somewhat stringent guidelines for exercise during pregnancy. The suggested duration of exercise was only 15 minutes, intensity was a

heart rate no greater than 140 beats per minute, and high impact activities were cautioned against (Sternfeld, 1997). Many researchers conducted studies, including those cited in this paper, in response to ACOG's recommendations, with evidence that women can exercise at higher intensities without harm to themselves or their babies. None of these articles claimed to have found the exact limits of beneficial exercise, considering the wide range of physical conditioning of pregnant women. Indications were, however, that healthy women with no special risks can exercise longer and more intensely than first thought or recommended (Schramm, Stockbauer, & Hoffman, 1996). This research convinced ACOG to modify its guidelines in 1994, omitting the earlier limitations.

The idea that physical activity during pregnancy might have a negative effect on the course and outcome of the pregnancy led to a large amount of research on both mother and baby. The stress that exercise places on the body is compounded by pregnancy, and was thought to create conflicting physiological demands which could adversely affect pregnancy outcome. During exercise, blood is redistributed away from splanchnic organs to resupply the working muscles with oxygen and glucose. This response to exercise raises a concern that the decrease in uterine blood flow may result in fetal hypoxia, decreased carbohydrate availability, increased fetal temperature, and increased uterine contractility. All of these changes might compromise development and growth of the offspring. Because of the physical adjustments during pregnancy, exercise increases the risk of musculoskeletal injury as well. The increasing size of the uterus places great stress on the lower back, and changes the center of gravity to make balance more difficult. Additional instability is due to the increased secretion of relaxin, which causes a laxity in the pelvic ligaments and softens the

fibrocartilage that holds together the pelvic bones and other joints. Over-compensation for these changes may result in injuries to joints, ligaments, and tendons.

For each of these potential physiological problems, it appears there are compensatory mechanisms that serve to protect the fetus (Sternfeld, 1997). Contrary to the expected increase in core body temperature, pregnant women manage to adapt and maintain a thermal balance. Exercise actually increases blood volume and cardiac output, which helps counteract blood loss from the visceral area, and augments heat dissipation through increased skin blood flow (Wang & Apgar, 1998). Increased blood volume and cardiac output also enhances the body's capability to supply the fetus with nutrients and oxygen, provided the mother maintains hydration by increasing fluid intake (Hale & Milne, 1996). Although exercise is known to increase uterine contractility, the magnitude of the contractions is small, and there is no evidence to suggest that preterm labor or delivery would result (Dye & Oldenettel, 1996).

Many studies have researched the effect of exercise on pregnancy, but these studies have concentrated largely on maternal and fetal physiologic response, rather than the outcome of the pregnancy. For example, Spinnewijn, Lotgering, Struijk, and Walolenburg (1996) studied fetal heart rate during and after maternal exercise, and found no lasting negative fetal effects. In another study, authors Veille, Kitzman, & Bacevice (1996) examined maternal cardiovascular function and ECG changes during bouts of exercise, and found only minimal electrocardiographic variance between exercise and control groups. Researchers have even studied one- and five-year developmental outcomes of the offspring of women who continued to exercise regularly throughout pregnancy. While these studies found that the offspring of exercising women scored significantly higher on tests of general

intelligence and oral language skills (Clapp, Simonian, Lopez, Appleby-Winebery, & Harcar-Sevcik, 1998), they did not examine immediate outcomes of the pregnancy itself.

While most research concludes only that exercise does not have a *negative* effect on pregnancy, fewer studies chart positive outcomes that have not been challenged in subsequent research. There is little uncontested literature that demonstrates a positive effect of exercise on pregnancy, delivery, or recovery. In one study, total weight gain, gestational period, and birth weight were found to be significantly lower in a minimal-conditioning exercise group compared with a control group who discontinued exercise or who were sedentary (Clapp & Little, 1995). In contrast, other studies found that women who participated in more vigorous exercise gave birth to heavier babies, and gained the same amount of weight as those who were recreationally inactive (Sternfeld, Quesenberry, Eskenazi, & Newman, 1995). Additional research has associated exercise with shorter active labor, fewer cesarean deliveries, decreased risk of gestational hypertension and pre-eclampsia as well as other complications, but again, a further review of the literature finds conflicting results (Dye et al., 1996).

Several studies have found that women who exercise during pregnancy report fewer symptoms common to pregnancy, such as nausea, fatigue, leg cramps, and backaches. In addition, there is evidence which indicates that exercise during pregnancy is associated with improved appetite, more restful sleep, and fewer medical complaints. Biologically, these effects may be the result of hormonal adaptations to exercise, such as increased endorphin levels. Anecdotal reports suggest that even labor is better tolerated by women who have exercised throughout pregnancy. Because both labor and exercise may be viewed as painful, a well-conditioned woman accustomed to exercise may have a lower perception of and

higher tolerance for pain (Hale et al., 1996). Also of note, women who exercise during pregnancy were found to experience a significantly shorter period of labor, which may be related to their increased cardiorespiratory fitness and ability to postpone fatigue (Horns, Ratcliffe, Leggett, & Swanson, 1996).

One should consider the social and psychological implications of exercise as well, such as a reported improvement in self-esteem and body image. Women who exercised in groups were found to have an increased sense of well-being and self image compared to pregnant women who did not exercise (Horns, et. al, 1996). The group setting also provides an opportunity to overcome a sense of isolation, where among other supportive women they can openly share feelings of anxiety and inadequacy. Mothers with common experiences can provide encouragement and emphasize that their insecurities are not unique. Lack of family support due to the transient lifestyle of the military can deepen early feelings of depression and helplessness. Since 47 percent of the active duty pregnancies at Fort Carson are to single soldiers, and 60 percent of active duty pregnancies are unplanned (PM Careline, 1998), an exercise group can provide reassurance and support these women may not find elsewhere. A message released by the Department of the Army (DA) in 1996 reinforces the need for group exercise, stating that pregnancy PT programs provide an ideal time for new expectant mothers to interact with “experienced” mothers. It provides an opportunity to educate new mothers-to-be on family care plans, parental responsibilities, nutrition, child care, and other topics. The DA message concluded that many installations already provide such programs, and find that the combination of exercise and education is highly beneficial to pregnant soldiers.

Specific to post-partum recovery, Clapp and Little (1995) discovered that exercise in itself improved emotional stability and helped women develop and master the new coping skills required for motherhood. Knowing how to manage stress is important, because lack of coping skills can have a significant impact on a mother's parenting ability, and can subsequently hinder development of the child. Findings that exercise can increase emotional stability and significantly decrease mood disturbances such as anxiety and depression are valuable, considering that up to 15 percent of new mothers experience postnatal depression (May, 1995). Presently, a prescribed medication is the common treatment for psychological disturbances. With cost concerns and the effects that medication may have on nursing infants, exercise as a non-pharmacological intervention for post-partum depression and anxiety may be preferable to new mothers and their physicians alike.

This review demonstrates that there is an abundance of literature available on the physiological, psychological, and even social aspects of exercise and pregnancy. There is far less research available that is specific to exercise, pregnancy, and military readiness. The monthly journal "Military Medicine" publishes an occasional article about pregnancy and active duty women, but they have not been exercise-related studies. Instead, the articles explore the overall pregnancy risk factors specific to active duty women. In September 1991, "Obstetrics and Gynecology" published a related article, "Pregnancy Outcome in an Active Duty Population" (Magann & Nolan, 1991), but this study also examined only the impact of active duty service on pregnancy.

A finding that is not military-specific but does have an impact on readiness is that post-partum physical recovery time decreases if mothers exercise during pregnancy. One study found that, in terms of physical ability, women in an exercise group recovered almost

twice as fast as a matched control group (Clapp et. al, 1995). Quicker recovery may be a result of reportedly fewer obstetrical and medical complications, lower weight gain, more rapid weight loss in the post-partum period, and fewer physical complaints. Other researchers documented a 27 percent increase in physical work capacity among women who exercised in a group, in comparison to only a 10 percent increase for the control group (Horns, et. al, 1996). Certainly, a decrease in recovery time and an increase in work capacity would have a positive impact on unit readiness.

The lack of established exercise targets from ACOG, or any other obstetric authority, encourages military physicians to prescribe physical training to pregnant soldiers "at your own pace" (Laurin, 1998). While this might be a realistic goal for experienced athletes, the ambiguous guidelines are more problematic for non-athletes. Suggesting that every pregnant soldier do as much exercise as she finds reasonable may in itself not constitute a reasonable recommendation (De Cree, 1998). When leaving soldiers with their units to exercise at their own pace, there is often not enough guidance for them to maintain fitness throughout pregnancy. A benefit of the pregnancy PT program is that knowledgeable leaders can show the women what exercises are safe during pregnancy, and avoid exercises that are harmful. The leaders are also available to monitor the women throughout the exercises to further ensure safety.

Exercising in this particular environment is important, because Master Fitness Trainers and other PT leaders at unit level do not receive training on appropriate workouts for pregnant women (Laurin, 1998). According to Barbara Sternfeld of the Kaiser Permanente Medical Care Program, the specific exercise prescription needs to be formulated on a sound understanding of the anatomical and physiological changes and demands

imposed by pregnancy. Another author even suggests that pregnant women are not safe exercising in a class that is not specifically structured for them (Baddeley, 1996). Some women may find that high-impact activities performed in unit PT programs become increasingly uncomfortable as their gestation progresses, and certain calisthenics pose an actual risk of abdominal trauma and other injuries to the pregnant soldiers. To ensure that the "Healthy Beginnings" instructors are qualified to lead pregnancy PT, the Wellness Center set up a training certification using ACOG guidelines. Additionally, all aerobics instructors received pregnancy training and certification through the American Association of Aerobic Instructors (AAAI), and the swimming instructor received training on water aerobics.

One final benefit of the pregnancy PT program may be that it can instill a desire to continue exercising past the post-partum period. While unit PT facilitates successful completion of the APFT and stresses military fitness, it is not always an enjoyable activity. Given the educational and social aspects and creativity of "Healthy Beginnings", it may actually help set a goal for lifetime fitness. Pregnancy is a time when women are particularly open to positive behavioral change, and it may be an optimal time for developing a lifetime activity habit of exercise (Sternfeld, 1997).

Research presented in the literature review thus far has reported on the physiological, psychological, and social aspects of pregnancy and exercise. Next, a summary of the events which led to the inception of "Healthy Beginnings" is presented, as well as a description of the program itself.

“Healthy Beginnings”

Army Regulation 350-41 (1993) exempts pregnant soldiers from their unit’s regular physical training and testing program for up to six weeks after delivery. In 1996, DA issued a message that extended the post-partum recovery time to six months. This message also recommended that Army installations offer PT programs to pregnant and post-partum soldiers. The goal of the training was to assist in maintaining fitness throughout pregnancy and returning the soldiers to pre-pregnancy fitness levels after delivery.

Following the release of the DA message, CHPPM began researching the topic of pregnancy and fitness, and gathered information from various installations that had existing pregnancy physical training programs. Because each installation had its own program and CHPPM was unsure of what training guidance it should issue, a Pregnancy Fitness Symposium was conducted in May of 1998 to determine criteria necessary for a successful Army-wide program. Representatives from each installation, including Fort Carson, presented their programs and from that input, created the basic guidelines for pregnancy training.

Members of the Symposium determined that the guidelines for a successful program must include:

--Installation commander’s support, along with the support of each tenant unit commander
--Mandatory attendance by all pregnant soldiers
--Funding and dedicated facilities for training
--Educational classes
--A post-partum fitness program
--Leadership by certified instructors
--Tracking of outcomes, especially APFT and weight control data

It is interesting to note that Health Promotion guidelines briefed to the Major Subordinate Command (MSC) meeting at the Army Medical Department Center and School (AMEDDC&S) in November of 1998 mirror those decided upon at CHPPM's pregnancy symposium. Among the similarities were the necessity for command interest and the need for education, funding, and outcome measurements. These similarities reinforce the importance of established guidelines.

The Mountain Post Wellness Center integrated CHPPM's guidance into its pregnancy PT program, and also used the ACOG's recommended guidelines for exercise and pregnancy. Wellness Center staff developed a weekly training schedule that includes three days of calisthenics, running/walking, aerobics, or swimming, and one morning of educational classes. This varied schedule is appreciated by the soldiers who, in unit PT, would not get the chance to participate in such an assortment of activities. For example, most units do not conduct PT at the swimming pool. However, because of its buoyant effect, pregnant women are more comfortable exercising in water than on land. They stay cooler in water, and because of its hydrostatic force, water can decrease edema and increase uterine blood flow (Katz, 1996).

In summary, while research exists that describes the effects of exercise on pregnancy, there is much less literature that documents the impact of exercise on recovery time and military readiness. The lack of research demonstrates the importance of studies such as this one. Future research, with emphasis on outcome measurements, should confirm the benefits of an Army-wide pregnancy fitness program.

Purpose

The purpose of this study is to use existing medical records and data gathered by "Healthy Beginnings" administrators to determine if frequent participation in the program has an effect on pregnancy, delivery, and recovery. A positive or neutral effect, coupled with the psychological, social, and educational benefits, would support continuation of the program. Finding a negative impact on these variables is also important, because this indicates the program needs improvement to meet its goals, or should be discontinued altogether.

METHODS & PROCEDURES

This retrospective study reviewed the medical records and attendance rosters of enrollees in Fort Carson's "Healthy Beginnings" program. Data was gathered on enrollees who had either passed the record APFT or were released back to their units after the six month post-partum recovery period. The Microsoft Excel database, maintained by the Wellness Center staff, was used to construct the data set.

To adhere to ethical policies involving research on human subjects, the Chief of Clinical Investigation at Brooke Army Medical Center reviewed the study protocol. Although informed consent was found to be unnecessary due to stipulations within the Privacy Act, enrollees in the training program were briefed on the nature of the study as a courtesy to them. The enrollees' names and social security numbers were not used for the final compilation of the data and do not appear in this report.

The alternate hypothesis is that frequent participation in Fort Carson's pregnancy PT program has an impact on pregnancy, delivery, and recovery. The null hypothesis is that

frequent participation in Fort Carson's pregnancy PT program does not have an impact on pregnancy, delivery, and recovery.

This study compared pregnancy, delivery, and recovery outcomes of frequent attendees in the program to the outcomes of infrequent attendees. Frequent attendance was deemed to be that level of attendance necessary to maintain pre-pregnancy conditioning and gain health-related, educational and social benefits, while also providing sufficient numbers of study subjects in both exercise groups. The level of frequency decided upon was an attendance record of 50 percent of the time or greater, over the course of the soldier's pregnancy and in the six months allotted for post-partum recovery. Infrequent attendees were those who attended less than 50 percent of the time. The five dependent variables chosen to compare these two groups are measurements commonly found in the literature review.

"Gestation period" describes which group is more likely to carry their babies to term. Gestation period is measured in weeks, and is a continuous variable measured on a ratio scale. It is calculated as the difference between the date of delivery and date of the last menstrual period as reported during the prenatal interview. Generally, premature birth is a pregnancy that lasts fewer than 38 weeks (Magann et. al, 1991). "Maternal weight gain" is the second variable, and is defined by the difference between mother's pre-pregnancy weight in pounds, as recorded at the first prenatal appointment, and weight at her last prenatal appointment. The last prenatal appointment is generally within one week of delivery. Weight gain is also a continuous variable measured on a ratio scale. A weight gain of 15 pounds or less is considered low, and 30 pounds or more is considered high (Kruger, 1979). The third variable is "complications during pregnancy or birth", which includes any

deviations from the norm, such as hypertension or needing a cesarean section delivery. This is a dichotomous variable measured on a nominal scale, and was coded "0" for no complications and "1" for complications. The fourth variable is "mother's post-partum weight loss", which is defined by the difference in pounds between mother's weight at delivery and weight after the six month recovery period. It is a continuous variable, measured on a ratio scale. The last variable used is "success or failure in passing a record Army Physical Fitness Test" (APFT) while in the post-partum phase of the pregnancy PT program. This is a dichotomous variable, measured on a nominal scale. A code of "0" was used for successful completion of the APFT, and a code of "1" signifies failure of the record APFT. After six months, women are automatically disenrolled from the program and sent back to their units even if they do not pass the APFT.

For the dichotomous variables of complications and APFT, chi-square analysis was used to determine if a significant difference exists between observed and expected outcomes. The remaining variables were continuous, and the Student's t test was used to measure the statistical significance of mean differences.

Validity

One goal of the "Healthy Beginnings" program is to promote healthy pregnancies, fewer complications, and a quick recovery. The question of validity may arise if this study measures something other than these three areas. Were the right variables used, and did they truly measure the outcomes they were intended to measure?

To increase the validity of this study, the variables chosen to evaluate whether or not the program's goals are met were well documented in previous research. The variables are also well defined by standard medical terms. For example, maternal weight gain, gestation

period, and the development of complications are all accepted health measurements of pregnancy, and can therefore be accurately used for this study.

However, whether or not these variables actually measure effects of the PT program or merely a soldier's fitness despite the program is questionable. Soldiers may come into the program in top physical shape, needing little help from the mandatory program to remain at that level. Other soldiers may have been poorly conditioned beforehand, and don't expect to get in shape during pregnancy. There is a chance that the variables used to measure program outcomes may instead be measuring these confounding effects.

Throughout the literature search, other measures were used to evaluate the effect of exercise and pregnancy. These variables include Apgar scores, birth weight, and surveys from the research subjects. While this study used only the five variables discussed in the Methods and Procedures section, to ensure a more complete coverage of the issue, additional variables could have been used.

Another approach to this type of study would be to measure pregnancy and recovery outcomes at an Army post with an optional pregnancy fitness program, and compare those scores to a post such as Fort Carson, where the training is mandatory. By evaluating optional and mandatory programs, one could compare women who are truly motivated to exercise throughout pregnancy to those who might attend only because they are required to.

An additional validity concern is the number of women evaluated in the study. Although there are over 300 women enrolled in the program, only 111 could be used for the final calculations. Even from these 111, not all the information was complete for each variable accessed, and the final number in each group in some cases, such as the APFT, dropped down to 24. These small numbers, coupled with a low average attendance rate of

only 50.58 percent, influenced the decision to choose a 50 percent attendance rate as the dividing rate for the exercise groups. However, the American College of Sports Medicine (ACSM) recommends a minimum of three aerobic sessions per week to maintain cardiorespiratory fitness and control body weight, which equates to a 75 percent attendance rate in the "Healthy Beginnings" program. Because a cutoff rate of 75 percent for the "Frequent Attendees" group would not provide for a sufficient number of study subjects in that group, the 50 percent attendance rate was chosen. While a 50 percent attendance rate may be enough to benefit from the muscular strength and endurance, and educational and social aspects of "Healthy Beginnings", not all the positive effects of the program will be maximally observed. Likewise, a greater number of women in each group might have made the observed differences statistically significant.

Reliability

The two main issues of reliability in this study are accuracy of both the attendance rates and the actual data collected. Because attendance rosters were not well kept at the beginning of the program, attendance rates could very possibly have been different than what was actually reported. Earlier rosters, from the first half of 1998, were inconsistently recorded. Attendance was handwritten on scraps of paper, and several dates were missing. Had attendance rates been better recorded, perhaps more women could have been counted in an "Above 75 percent" group, and a statistically significant difference in outcomes may have been discovered.

Program record keeping improved in the summer of 1998, when several Wellness Center staff members were assigned specifically to monitor the "Healthy Beginnings" program, resulting in greater accountability. At that time, the program became a command

interest, which increased enrollment and attendance rates. Unexcused soldiers were counseled and their chain of command was notified. With improved leadership and a continuation of these enforcements, data from the attendance rosters has become more reliable.

The outcomes data collected for this research is believed to be reliable, or accurate, because patient information was documented according to hospital policy and medical standards. For example, medical guidelines specify how a care-giver determines length of gestation, and a common method was used to measure maternal weight gain. The third variable of the study, complications, is annotated several different places in the mother's medical records to ensure that the best care possible is provided. Information for these variables comes directly from Standard Form 533, entitled "Prenatal and Pregnancy". This form is kept in every obstetric patient's medical record. Verification of this information was made by cross-checking a community nursing form titled "Pregnancy Surveillance Record", which is maintained at the hospital's Occupational Health Clinic. Other forms found in the medical record were used for verification as well. These forms include Standard Form (SF) 539, "Abbreviated Medical Record", which documents complications during pregnancy. Listed under the Diagnosis and Procedures sections of the "Record of Inpatient Treatment" are any complications during labor and delivery. Finally, SF 534, titled "Labor", also records complications during labor and delivery, as well as gestational age and maternal weight gain. In addition, the detailed definitions provided in the "Methods and Procedures" section of this paper make it possible for a reader to duplicate the results, which is a good indicator of reliability.

One drawback to this study is that every medical problem related to pregnancy, labor, or delivery was included in the category labeled “Complications”, regardless of the severity level. Measuring the variable in this way led to what appears to be a high percentage of overall complications for both the high and low attendance groups. In fact, many of these problems would not be considered true complications in other research studies. Additionally, there is little historical data with which to compare the “complications” rate calculated in this study, because most rates are recorded by specific complication, such as cesarean section or preeclampsia. More realistically, the incidence of cesareans for both groups in this study was 18 percent, which is quite low compared to other reports (Horns et. Al, 1996). One reason for this low percentage is that, according to Army regulation, women with high-risk pregnancies are not enrolled in the exercise program without clearance by an obstetric specialist. Such providers may err on the side of safety and advise against physical training, which means their patients would not have been included in this study.

RESULTS

The expected finding of this research was that frequent attendees of the pregnancy PT program have healthier pregnancies, fewer complications, and a quicker recovery than do infrequent attendees. However, in all but the APFT variable, this research supports the null hypothesis that the outcomes of the two groups were similar. Although there were slight differences for each variable in favor of the higher attendance group, the only significant difference was in the pass rate of the APFT.

Table 1. Comparison of Outcome Variables

	Over 50% Attendance			Under 50% Attendance		
Variable	*n*	Mean	SEM	*n*	Mean	SEM
Gestation Period *(in weeks)*	58	38.44	0.35	42	39.31	0.23
Weight Gain *(in pounds)*	57	37.79	1.58	42	38.79	1.86
Complications *(no=0, yes=1)*	57	0.36	0.07	43	0.48	0.08
Record APFT *(pass=0, fail=1)*	30	0.23	0.08	24	0.54	0.10

Table 1 shows the number (*n*) of women evaluated from each exercise group for each variable, and each group's mean and Standard Error of the Mean (SEM). For each variable, *n* differed either because of incomplete medical or PT program records, or because the records could not be found. In the case of the APFT, the number of women in each group was small because some women had not yet completed their six month recovery period or did not yet feel ready to take a record APFT. The variable "Weight Loss" was not calculated because only 16 women had their weight recorded on the APFT card, and any statistical calculation would not be reliable with such a small *n*. The program's failure to track weight loss is unfortunate, as the problem of overweight post-partum mothers returning to duty has been elevated to the level of the post commanding general. One Army study reported that 48 percent of postpartum soldiers failed to return to their pre-pregnancy level even after six to nine months of recovery time (Davis, 1998).

Table 2 shows the statistical significance for each variable at $p < 0.05$.

Table 2. Significance of Results

Variable	Statistical test	Degrees of Freedom	Significance
Gestation Period	t test	98	NS
Weight Gain	t test	97	NS
Complications	chi square	1	NS
Record APFT	chi square	1	S*

NS = not significant, S = significant
* $p < 0.02$

DISCUSSION

Figures 1and 2 are graphic depictions for each variable, included in this paper so the reader can easily see the similarities between, and even the variance within, each attendance group. The green diamonds show the scores of each participant (labeled "enrollee" in the chart legend) in the "Over 50 percent Attendance Group" and the red squares represent each member in the "Under 50 percent Attendance Group". The green line on each chart represents the mean for the "Over 50 percent Attendance Group", and the red line represents the mean for the "Under 50 percent Attendance Group".

Figure 1. Comparison of gestation period and deviation from mean for each attendance group enrollee

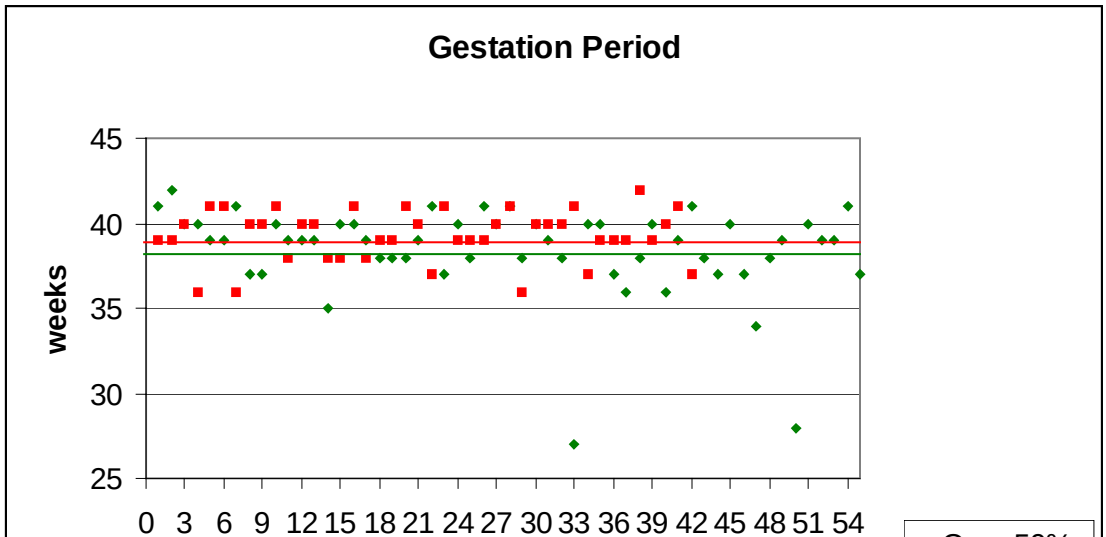
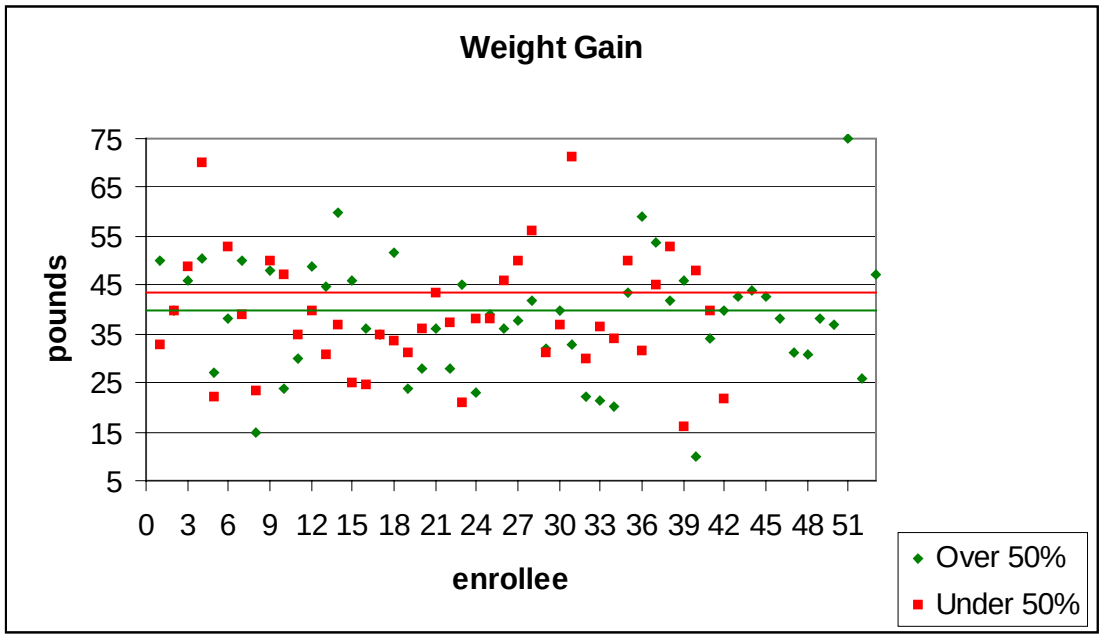


Figure 2. Comparison of weight gain and deviation from mean for each attendance group enrollee



These graphs also show that for each variable, a few enrollees experienced considerable variance in their outcomes. For example, two women gave birth to very premature babies, with a gestation period under 30 weeks. The variable "weight gain"

shows even more variance, with three women gaining 70 pounds or more, and two women gaining 15 pounds or less. Thinking these outliers might skew the statistical analysis, a Student's t test was again performed after the most extreme one percent of the scores were dropped. Even when these scores were eliminated, the differences between the groups were still not significant.

Figure 3 represents the number of complications counted for each attendance group. In the "Over 50 percent Attendance Group", 21 women had some type of obstetrical or medical complication, and 36 women did not. In the "Under 50 percent Attendance Group", 21 women had some type of complication, and 22 women did not. These differences were not statistically significant.

Figure 3. Comparison of number of complications for each attendance group

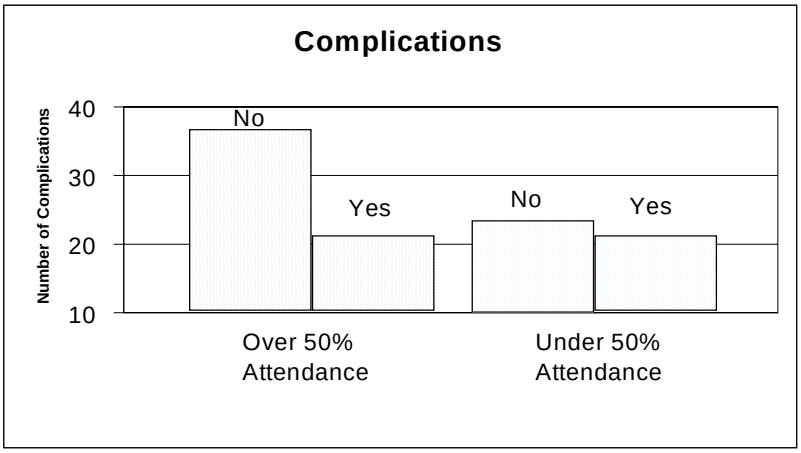
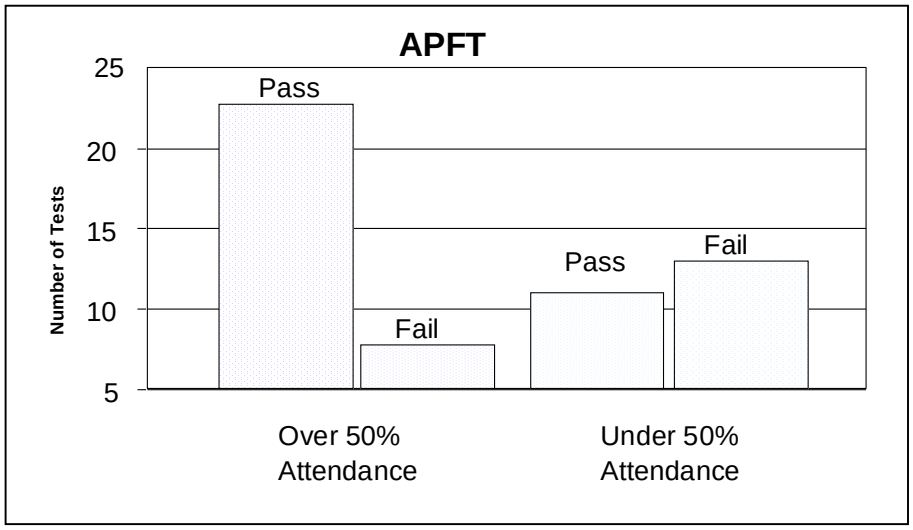


Figure 4 shows the number of passes and failures of the record APFT for each attendance group. In the "Over 50 percent Attendance Group", 23 women passed their APFT, and 7 failed. In the "Under 50 percent Attendance Group", 11 women passed, while 13 failed. The finding that frequent attendees of the program are significantly more likely than infrequent attendees to pass a record APFT is an important one. A unit's readiness status greatly depends on the physical conditioning of its soldiers, and this study has shown that with frequent attendance at the "Healthy Beginnings" program, post-partum soldiers will return to their units meeting the Army's fitness standards.

Figure 4. Comparison of passes and failures of the APFT for each attendance group



The results of this study indicate that advocates of special pregnancy PT programs need to conduct further research to determine if the neutral impact of the majority of these

variables is a reflection only of the Fort Carson program, or if it is an Army-wide trend. Especially now that CHPPM is establishing an exportable training package for all Army installations, it is important that the program effectively meet its goals.

One explanation for the lack of difference between the exercise groups for the variables of gestation period, weight gain, and complications may be that the women studied were all active duty service members, who because of pre-accession medical screening, are healthier than the civilian population (Magann et al, 1991). According to a 1989 Public Health Service report, health status prior to conceiving is a contributing factor to reduced risk and improved pregnancy outcomes (Swan & Apgar, 1995). Active duty soldiers may have relatively healthy pregnancies regardless of ante-partum exercise levels because of their better than average health status and physical conditioning before they become pregnant. For example, the average gestation period for both groups was 38 to 39 weeks, which is well within the normal range. Frequent attendees of the program delivered their babies on the average of one week earlier, which parallels another study that found mothers who exercised delivered their babies on the average of 6 days earlier than a control group (Clapp, 1996).

In contrast, both groups had a mean weight gain in excess of 30 pounds, which is considered high by some accounts (Kruger, 1979). Identifying this high average post-partum weight gain is an important indication that the “Healthy Beginnings” staff should track ante-partum weight loss more closely. Providing more assistance and emphasis on weight loss might encourage new mothers to return to their pre-pregnancy weight before they reach the end of the six month recovery period.

Another explanation for the lack of difference between attendance groups is that the soldiers in this program appear less than enthusiastic about exercising. Granted, while

pregnant, even the most highly-conditioned woman may not always feel well enough to exercise, but as a whole, the soldiers in this program do not seem to adequately participate. Even if a soldier attends the program on a frequent basis, if she is not working to the best of her physical ability, the activity may be of little benefit. "Healthy Beginnings" is a well-structured program, with the capacity for excellent health maintenance, but only if the women are actively involved. Because a large number of these pregnancies are unplanned, many soldiers may feel apathetic about their health status, but the program staff should find a way to encourage these women to become more involved. Increasing the soldiers' motivation levels will lead them to participate more actively, which might improve chances for positive pregnancy outcomes.

CONCLUSION AND RECOMMENDATIONS

The purpose of this study was to determine if frequent participation in the Fort Carson pregnancy PT program had an impact on pregnancy, delivery, and recovery. The results of the study prove inconclusive for the three variables representing pregnancy and delivery. While the outcomes of these variables favored the frequent participation group, the differences were not significant enough to accept the alternate hypothesis. However, frequent attendance in the program was found to have a positive impact on post-partum recovery, where members of that group were more likely to pass a record APFT. In this event, the null hypothesis can be rejected in favor of the alternate hypothesis.

Despite the inability to reject the null hypothesis in most cases, this is not a recommendation to discontinue the "Healthy Beginnings" program. Citing the social, psychological, and educational issues discussed in the literature review, the program offers more benefits than the outcome measurements were able to convey. Besides, the

alternatives to “Healthy Beginnings” are not nearly as attractive. If a soldier stays with her unit for physical training or is exempt altogether, she will not benefit from the educational classes, social support, safety monitoring or guidance that is provided by the Wellness Center. In any event, the results of this study are similar to the many other reports found in the literature review which simply conclude that exercise does not have a negative impact on pregnancy.

With this summer’s record keeping improvements, increased unit support, and command interest in the program, a similar study conducted in the future might find results that can confirm a hypothesis that “Healthy Beginnings” positively impacts pregnancy, delivery, and recovery. Further research could carry this study one step further and investigate whether or not the soldiers enrolled in “Healthy Beginnings” return to their units at pre-pregnancy fitness levels. The outcomes of such research may help create a more effective Army-wide pregnancy PT program, with results that definitely improve military readiness.

Because “Healthy Beginnings” is so well structured and already such a benefit to Fort Carson’s pregnant soldiers, no recommendations are made to change the activities in the program. The only recommendations made at this time are that staff members continue to improve record keeping and increase motivation levels of the participants. Documenting program information such as attendance rates and weight loss is vitally important for future research, and increased motivation levels will improve the effectiveness of the program.

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